# A BILL TO PROVIDE FOR THE ESTABLISHMENT, UNDER THE NATIONAL SCIENCE FOUNDATION, OF A NATIONAL SCIENCE ACADEMY

THE UNIVERSITY OF MICHIGAN
OCT 4 1960
MAIN READING ROOM

# HEARINGS

BEFORE

## SUBCOMMITTEE NO. 3

OF THE

## COMMITTEE ON SCIENCE AND ASTRONAUTICS U.S. HOUSE OF REPRESENTATIVE

EIGHTY-SIXTH CONGRESS

SECOND SESSION

ON

## H.R. 4986

MAY 4 AND 25, 1960

[No. 14]

Printed for the use of the Committee on Science and Astronautics

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1960

## COMMITTEE ON SCIENCE AND ASTRONAUTICS

OVERTON BROOKS, Louisiana, *Chairman*

JOHN W. McCORMACK, Massachusetts
GEORGE P. MILLER, California
OLIN E. TEAGUE, Texas
VICTOR L. ANFUSO, New York
B. F. SISK, California
ERWIN MITCHELL, Georgia
JAMES M. QUIGLEY, Pennsylvania
LEONARD G. WOLF, Iowa
JOSEPH E. KARTH, Minnesota
KEN HECHLER, West Virginia
EMILIO Q. DADDARIO, Connecticut
WALTER H. MOELLER, Ohio
DAVID S. KING, Utah
J. EDWARD ROUSH, Indiana
THOMAS G. MORRIS, New Mexico

JOSEPH W. MARTIN, JR., Massachusetts
JAMES G. FULTON, Pennsylvania
GORDON L. McDONOUGH, California
J. EDGAR CHENOWETH, Colorado
FRANK C. OSMERS, JR., New Jersey
WILLIAM K. VAN PELT, Wisconsin
A. D. BAUMHART, JR., Ohio
PERKINS BASS, New Hampshire
R. WALTER RIEHLMAN, New York

CHARLES F. DUCANDER, *Executive Director and Chief Counsel*
Dr. CHARLES S. SHELDON II, *Technical Director*
SPENCER M. BERESFORD, *Special Counsel*
PHILIP B. YEAGER, *Special Consultant*
JOHN A. CARSTARPHEN, Jr., *Chief Clerk*
FRANK R. HAMMILL, Jr., *Counsel*
RAYMOND WILCOVE, *Staff Consultant*
RICHARD P. HINES, *Staff Consultant*
Capt. HOWARD J. SILBERSTEIN, U.S.N., *Staff Consultant*

---

### SUBCOMMITTEE NO. 3

VICTOR L. ANFUSO, New York, *Chairman*

ERWIN MITCHELL, Georgia
EMILIO Q. DADDARIO, Connecticut
DAVID S. KING, Utah

JAMES G. FULTON, Pennsylvania
WILLIAM K. VAN PELT, Wisconsin

SPENCER M. BERESFORD, *Special Counsel*

The chairman of the full committee and the ranking minority member are ex officio members of all subcommittees.

DEPOSITED BY THE
UNITED STATES OF AMERICA

# CONTENTS

Statement of— Page
Ferri, Dr. Antonio, Head, Department of Aeronautical Engineering, Polytechnic Institute of Brooklyn ..... 10
George, Hon. Newell, a Representative in Congress from the State of Kansas ..... 6
Horne, Charles F., vice president, Convair ..... 19

# A BILL TO PROVIDE FOR THE ESTABLISHMENT, UNDER THE NATIONAL SCIENCE FOUNDATION, OF A NATIONAL SCIENCE ACADEMY

---

**WEDNESDAY, MAY 4, 1960**

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE No. 3,
*Washington, D.C.*

The subcommittee met at 10:15 a.m., Hon. Victor Anfuso (chairman of the subcommittee) presiding.

Mr. ANFUSO. The meeting will come to order.

This morning, Subcommittee No. 3 of the Science and Astronautics Committee of the House will hold its first hearing on H.R. 4986, a bill to establish a science academy.

(The bill referred to is as follows:)

[H.R. 4986, 86th Cong., 1st sess.]

A BILL To provide for the establishment, under the National Science Foundation, of a National Science Academy

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That this Act may be cited as the "National Science Academy Act".

SEC. 2. The Congress hereby finds that the progress of science has greatly advanced the national health and economy, further secured the common defense, and contributed to the general welfare; that in order to increase such benefits still further a more regular and intensive national training program in science and engineering is needed; and that the National Science Foundation is eminently fitted to organize and operate such a program. It is therefore declared to be the policy of the United States and the purpose of this Act to provide for the establishment, under the National Science Foundation, of a National Science Academy.

SEC. 3. There is hereby established, under the National Science Foundation, a National Science Academy (referred to in this Act as "the Academy") to train selected men and women, to be known as science-trainees, in the field of science or engineering for service as officers or employees of the United States.

SEC. 4. The Director of the National Science Foundation (hereinafter called "the Director") shall determine the location of the Academy within the United States in the following manner:

(1) The Director shall establish immediately a commission, and appoint five members thereof, to advise him in connection with the selection of a permanent location for the Academy. The commission shall make its report to the Director as soon as practicable.

(2) The Director shall accept the unanimous decision for a permanent location by such commission. In the event such recommendation is not unanimous, the commission by a majority vote shall submit to the Director three sites from which the Director shall select one as the permanent location.

(b) Following the selection of a location for the Academy the Director is authorized—

(1) to acquire land from other Government agencies without reimbursement, with the consent of such agencies;

(2) to acquire lands and rights pertaining thereto, or other interests therein, including the temporary use thereof, by donation, purchase, exchange of Government-owned lands, or otherwise;

(3) to prepare plans, specifications, and designs, to make surveys and to do all other preparatory work, by contract or otherwise, as he deems necessary or advisable in connection with the construction, equipping, and organization of the Academy at such location; and

(4) to construct and equip temporary or permanent public works, including buildings, facilities, appurtenances, and utilities, at such location.

SEC. 5. For the purpose of providing temporary facilities and enabling early operation of the Academy, the Director is authorized to provide for the erection of temporary buildings and the modification of any existing structures and facilities at the location of the Academy, as determined under section 4 of this Act, and to provide for the proper functioning, equipping, maintaining, and repairing thereof; and to contract with civilian institutions for such operation or instruction as he may deem necessary.

SEC. 6. To be eligible for admission to the Academy a candidate—

(1) must be at least seventeen years of age and must not have passed his twenty-fifth birthday on July 1 of the year in which he enters the Academy; and

(2) must show, by an examination prescribed and supervised by the National Science Foundation, or by any other agency or commission established by the Director and designated by him to conduct such examination, that he is qualified in the subjects prescribed by the Foundation.

SEC. 7. (a) Upon designation by the President, the Director may permit persons who are citizens or nationals of foreign states friendly to the United States to receive instruction at the Academy. Not more than seventy-five persons may receive instruction at the Academy under this section at any one time.

(b) The Director shall, before permitting any person referred to in subsection (a) of this section to receive instruction at the Academy, provide for such security investigations of such person as the Director may deem advisable to protect the interests of the United States.

(c) A person receiving instruction under this section shall be entitled to receive the pay, allowances, and emoluments of a science-trainee appointed from the United States, and from the same appropriations, except that no such person shall be entitled to receive a mileage allowance for travel to the Academy for initial admission.

(d) Except as the Director may determine, a person receiving instruction under this section shall be subject to the same regulations governing admission, attendance, discipline, resignation, discharge, dismissal, and graduation as a science-trainee appointed from the United States. No such person shall, however, be entitled to an appointment as an officer or employee of the United States by reason of his graduation from the Academy.

(e) No person receiving instruction under this section shall be required to take or subscribe to an oath of allegiance to the Government of the United States.

SEC. 8. Each science-trainee who is a citizen or national of the United States shall sign an agreement that, unless sooner separated, he will complete the course of instruction at the Academy, and accept an appointment and serve as a civilian officer or employee of the United States (or as a commissioned officer of the United States Army, the United States Navy, the United States Air Force, or the United States Marine Corps), in the field of science or engineering for which he is trained, until the fifth anniversary of his graduation from the Academy. If the science-trainee is a minor and has parents or a guardian, he may sign the agreement only with the consent of the parents or guardian.

SEC. 9. To permit an orderly increase in the number of science-trainees during the period ending not more than four years after the entrance of the initial class at the Academy, the Director may limit the number to be appointed each year during that period in the following manner:

(1) Each Senator and Representative shall nominate not to exceed ten persons, who shall be eligible to take a competitive examination which shall be held annually. The number of vacancies allocated to each State shall be proportional to the representation in the Congress from that State. Appointments from each State shall be made from among qualified candidates nominated from that State in the order of merit established by the examinations.

(2) Vacancies allocated to other sources shall be filled from among qualified candidates in each category in the order of merit established by similar competitive examinations and shall not exceed 15 per centum of the total number of appointments authorized.

SEC. 10. (a) The science-trainees of the National Science Academy shall, upon their graduation, be appointed as officers or employees of the United States to the extent that suitable vacancies exist in the field of science or engineering for which they are trained.

(b) The Director shall by regulation provide for the distribution of appointments made pursuant to this section.

SEC. 11. All appropriate provisions of law which pertain to the United States Military Academy (except provisions which are limited in application to training in military matters) shall, by the authority of this section, also pertain, mutatis mutandis, to the National Science Academy, to the extent not inconsisent with the purposes of this Act. The functions which, under those laws, are exercised by the Secretary of the Army with respect to the United States Military Academy and the Army shall, by the authority of this section, be exercised by the Director of the National Science Foundation with respect to the National Science Academy and the scientific and engineering programs of the United States (insofar as those programs are subject to the exercise by the Director of those functions under the other provisions of this Act). The organization of the National Science Academy shall be prescribed by the Director of the National Science Foundation.

SEC. 12. The President is authorized and directed to establish a Scientific Career Service in the Federal Government. Such Career Service shall be established in such manner that it will—

(A) place the Government in a more favorable position than it now occupies with respect to obtaining and retaining the quality and quantity of personnel necessary to carry out the scientific, technological, and research and development functions of the Government.

(B) attract to and retain in the Government service personnel of high caliber, ability, capacity, and potential in the scientific, technological, and research and development fields,

(C) offer maximum incentives for such personnel in the form of compensation, promotion and advancement, career opportunities, prestige of service, and other employment benefits,

(D) provide flexibility in order to facilitate the full development and effective utilization by the Government of the education, training, experience, ability, and productive capacity of such personnel, and

(E) with respect to such scientific positions, contain and apply the principle of equal pay for substantially equal work by such personnel and give effect, in terms of position classification, compensation, and scientific standing of such personnel, to substantial differences in (i) the difficulty and importance of the work to be performed, (ii) the degree of responsibility and skill to be exercised, (iii) the scope and variety of the tasks involved, and (iv) the education, training, experience, and other qualification requirements.

SEC. 13. (a) Each science-trainee who is appointed upon his graduation as an officer or employee of the United States under this Act shall be placed in the Scientific Career Service established under section 12 of this Act.

(b) Each person who is an officer or employee of the United States and who performs the duties and responsibilities of any position with the purview of the Scientific Career Service established under section 12 of this Act and whose qualifications, education, training or experience are such as to meet the standards established for such Scientific Career Service shall be eligible to be placed in such Scientific Career Service.

Mr. ANFUSO. The main purpose of these hearings will be to consider how an institution sponsored by the Federal Government could help to meet our pressing national problems in science and engineering education.

There are three specific national problems that suggest the value of a science academy:

1. The lack of an adequate and reliable supply of qualified scientific and engineering personnel for employment by the civilian and military agencies of the Federal Government.

2. The shortage of qualified science teachers, especially in our secondary schools.

3. Our lag compared with the U.S.S.R. in the annual number of graduates both in engineering and in many fields of natural science. In 1959, for example, the U.S.S.R. produced about three times as many graduate engineers as the United States.

I would like to give the committee and also insert in the record certain very significant figures.

No. 1, take the number of professional engineers. The United States at the present time has 850,000 professional engineers as compared to 894,000 in the U.S.S.R. Time was, only a few years ago, when the United States far surpassed the U.S.S.R. in the number of professional engineers. But these are the figures as of the end of 1959.

No. 2, take the annual number of engineering graduates. We have 48,000 graduating each year as compared to 106,000 for the U.S.S.R., a very astounding difference.

No. 3, take the holders of advanced degrees, such as Ph. D., in the United States. In the U.S.S.R. they call it a kandidat. The number of such engineering degrees is 8,000 in the United States as compared to 25,932 in the U.S.S.R. We have 35,000 holders of advanced degrees in physical and mathematical science, as compared to the Russians 17,406. This is the only field where we are ahead in this respect at the present time. We have 24,000 holders of advanced degrees in life sciences, other than medical practitioners, as compared to the Russians 32,341. The number of advanced degrees granted in science and engineering from 1941 to 1955 was 27,257 in the United States as compared to 32,022 in the U.S.S.R.

Returning to the bill before us, I want to make it clear that I do not regard the proposed science academy as excluding or even restricting the provision of additional scholarships, fellowships, and loan funds, or as competing with further direct aid to existing educational institutions. In my opinion, the urgency of the times requires us to act in all these ways and in many others.

First and foremost, a national science academy would provide additional incentives for our young people to pursue careers in science and engineering. It could focus public attention, arouse interest, and stimulate career motivations. Perhaps this is the most important step this country can take to make up the present shortage of qualified personnel for science teaching and for Government service in the natural sciences and engineering.

A science academy would also extend the opportunities for higher education in these fields to many able students of both sexes who now, for economic reasons or otherwise, fail to complete such training under our present educational system.

Might I here pause to explain the difference between the National Science Academy, which is proposed under H.R. 4986, and other academies such as those of the Army, Navy, and Air Force. The latter have stringent physical requirements and are restricted also to the male sex. The science academy would not be restricted to the male sex, because we have a number of young women who aspire to a science career and some of them have already excelled in our various institutions in science. Nor do we have to limit the science academy to per-

fect physical specimens, because successful and useful careers in science and engineering do not depend on physical fitness.

Dr. Alan T. Waterman, the Director of the National Science Foundation, recently testified as follows before a committee of the House of Representatives:

> In this country, where most students at the undergraduate level must provide for a large part of their support, there is no doubt that some highly capable youth cannot attend college because of lack of funds; others because of lack of interest or motivation.

By providing additional motivation and financial support, a science academy could make good use of potential talents that would otherwise be lost.

There are many other ways in which a science academy could help to meet the national needs that I have described. Some of these ways will be brought out in the hearings. Perhaps a science academy could be useful in setting educational standards, and so raise the level of scientific and engineering education throughout the country. Perhaps it could provide a screening process, and act as a clearinghouse as well as an open door. I have in mind that some unsuccessful candidates for the academy might be eligible for scholarships, fellowships, and loans enabling them to attend existing institutions. In the course of the hearings, these possibilities and others will be developed further.

There is no need to stress the importance of the basic and engineering sciences in the world of today. It is imperative to strengthen our human resources in these fields, for the sake of our future prosperity and national security.

I might add that perhaps the future of the world, including its very survival, will depend on continued progress in the field of science.

I would like to add at this time that in the Senate a very distinguished Senator, Senator Albert Gore, introduced a similar bill to H.R. 4986. He wrote me a letter dated April 27, 1960, which I want inserted in the record. He said:

> DEAR CONGRESSMAN: I am sorry I am so long in replying to your letter relative to the hearings you plan to hold on bill H.R. 4986. I indeed appreciate the fact that you have suggested that I might be one of the first witnesses in these hearings. As you know, I am very much interested in the subject matter of your bill, having introduced a similar bill in the Senate.
>
> As my administrative assistant explained to your subcommittee counsel today, I find unfortunately that I will not be able to participate in your hearings on May 4. I have an out-of-town engagement scheduled for that day. I shall certainly be interested in following the progress of the hearings, however, and I hope that your proposal will receive early and favorable consideration by the committee and by the House. It will be a pleasure to cooperate with you in seeking the enactment of a bill for the establishment of a national science academy.
>
> With kindest regards, I am
>
> Sincerely yours,
>
> ALBERT GORE.

I might say I have since talked to Senator Gore, and he said he would testify before this subcommittee at a future hearing.

We also have a letter from the vice president and manager of Convair in California. He writes:

> DEAR CONGRESSMAN ANFUSO: Thank you for sending me a copy of H.R. 4986 in which you propose to establish a national science academy.

I believe the idea is excellent. Our Nation must produce more scientists and engineers, both in quantity and quality, if we are to survive in our present technological space age. I feel a national science academy would be a great motivating force in this effort.

I have three specific recommendations. I would recommend that the academy be established on the graduate rather than the undergraduate level. Selection to the academy thus would be more critical because selection would be based upon 4 years of college accomplishment in addition to the examination. The science trainees would be more mature and would be much further advanced in their scientific development.

I also recommend that provision be made to have a rotating faculty plan. Outstanding scientists could be brought in to teach for a year, for a semester, or to conduct special seminars. The academy would have little chance of becoming stagnant in its thinking and teaching. New ideas would constantly be infused. Naturally, a continuity would have to be maintained. This could be accomplished by maintaining a nucleus of prominent personnel and by rotating the faculty in sections. This plan would follow the general policy of the services Academies.

Finally, some provision should be made to keep the academy nonpolitical. An academy of this stature will not be effective if its objectives and plans ever are challenged by political pressure.

I will be most interested to hear of further developments in this matter. Please advise me if I can be of assistance.

Sincerely,

C. F. HORNE,
*Vice President and Manager.*

Of course, this academy, if established, will be nonpolitical.

As the first witness for today we have the honor and extreme pleasure of introducing a Member of Congress who not too long ago won an overwhelming victory in the great State of Kansas. Right after this tremendous victory, he met with a very serious accident, but despite the fact that he should have remained long in convalescence he came to the Congress on crutches and received his oath from the Speaker of the House of Representatives while he stood there on crutches. Congressman Newell George, we are very honored and pleased to have you.

Do you have a statement to make?

## STATEMENT OF HON. NEWELL GEORGE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF KANSAS

Mr. GEORGE. Yes, Mr. Chairman. I am certainly happy to be a witness before your distinguished committee and these honorable members. I do have a statement that I would like to file. I agree with everything that you said as to the need for this academy. From my brief tenure here I realize that a number of youngsters are constantly trying to make the service academies. I think if this Academy should be established, we would have the same desire for young men and women to be admitted to the academy.

The fact that Russia is so far ahead of our country now in many fields of education, particularly in science and engineering, is the best reason that can be given in my opinion for the establishment of such an academy.

For example, in my State of Kansas, in the Second District near Lawrence and De Soto, there is over 10,000 acres of the Sunflower Ordnance Plant standing idle that would be a perfect place. The Government owns the land. There is is over a half billion dollars invested. The Defense Department would rather spend money elsewhere.

Mr. ANFUSO. In Iowa?

Mr. GEORGE. This is in Kansas.

Mr. ANFUSO. You would like to have the Academy built in Kansas?

Mr. GEORGE. Yes, sir. We have a place where the Government already owns the land. It doesn't make much difference where it is located, however, if it can be established.

Mr. ANFUSO. How much land is it?

Mr. GEORGE. Over 10,000 acres. Over half a billion dollars invested.

Mr. ANFUSO. You say the Government is now using it?

Mr. GEORGE. It is standing idle.

Mr. ANFUSO. Who owns it?

Mr. GEORGE. The Army.

Mr. ANFUSO. The Government owns it but it is not being used.

Mr. GEORGE. It is on a standby basis.

Mr. ANFUSO. It is vacant land?

Mr. GEORGE. It is on a standby basis. They have a skeleton crew there to keep the machinery up to date.

Mr. ANFUSO. There are buildings on it?

Mr. GEORGE. That is right. If I may file my statement and also an extension of my remarks in the Congressional Record on September 11, 1959; also a copy of my resolution which was merely for a committee study. I am happy to know that you Mr. Chairman, introduced a bill which I hope will be successful. Thank you very much.

(The prepared statement of Mr. George is as follows:)

Mr. GEORGE. Mr. Chairman, I am happy to have the opportunity to appear before you this morning in support of Mr. Anfuso's bill, H.R. 4986, to establish a National Science Academy. On September 11, 1959, I introduced House Resolution 388 asking for a complete investigation of the feasibility of establishing a U.S. science and engineering academy.

The American public is looking with critical eye at our defense and research in space programs. Since October 1957 there has been a growing realization of our actual status in science and engineering as compared with that of Soviet Russia. It is quite clear that the Soviet leadership is diverting a large part of that nation's resources to education and science. As a result, the Russians are graduating engineers at a ratio of 3 to our 1.

I am not an advocate of a compulsory system for channeling talented young people into the research fields. Our need for trained personnel can be met with the establishment of a National Science Academy, similar to the U.S. Military, Naval, and Air Force Academies, as called for in H.R. 4986.

Such an Academy, in the words of Mr. Anfuso's bill—

"will attract to and retain in Government service scientific, technological, and development personnel of high caliber by offering maximum incentives in compensation, advancement, and prestige."

If offered by a National Science Academy, these incentives would greatly enhance our efforts to insure that sufficient young people are guided into the research fields.

It seems tragic that in this century the only times we have shown intensive national purpose have been those of the two World Wars and the great depression. Had it been possible for Russia to conceal the ascent into space of sputnik and its successors, I doubt very much that the administration would have yet acknowledged the technological advancement which has been made by the Soviet Union, and we would have been ever further behind. However, the need for increased emphasis on science has been clearly illustrated. Indeed, it is fundamental to the continued greatness of our country.

It would be naive to overlook the competitive challenge of communism. While all Americans shudder at the thought of conflict of any kind, it is unrealistic to overlook the fact that the Soviets plan to graduate 125,000 engineers annually in the next 5 years as compared with our forecast of about 38,000 a year. In order to meet this challenge we must place more emphasis on the training and development of the outstanding scientists and engineers.

On September 11, 1959, I inserted in the Appendix of the Record an editorial from the June 28, 1956, issue of the Western Spirit, a newspaper published in Paola, Kans., and I would like to have my extension of remarks included with my statement.

Most of us are well aware of our deficiency and wasted potential, and it is certainly past time that something was being done in order to regain our momentum in the education field. The proper solution, Mr. Chairman, is to enact the legislation sponsored by my distinguished colleague, Mr. Anfuso.

(The bill and excerpt from the Congressional Record referred to are as follows:)

[H. Res. 388, 86th Cong., 1st sess.]

RESOLUTION

*Resolved*, That the Committee on Science and Astronautics, acting as a whole or by subcommittee, is authorized and directed to conduct a full and complete investigation and study of the feasibility of establishing a United States Science and Engineering Academy either of a type similar to the United States Military, Naval, and Air Force Academies or of any other type, and problems related to the establishment of such an Academy.

For the purpose of carrying out this resolution the committee or subcommittee is authorized to sit and act during the present Congress at such times and places within the United States, including any Territory, Commonwealth, or possession thereof, whether the House is in session, has recessed, or has adjourned, to hold such hearings, and to require, by subpena or otherwise, the attendance and testimony of such witnesses and the production of such books, records, correspondence, memorandums, papers, and documents, as it deems necessary; except that neither the committee nor any subcommittee thereof may sit while the House is meeting unless special leave to sit shall have been obtained from the House. Subpenas may be issued under the signature of the chairman of the committee or any member of the committee designated by him, and may be served by any person designated by such chairman or member.

The committee shall report to the House as soon as practicable during the present Congress the results of its investigation and study, together with such recommendations as it deems advisable. Any such report which is made when the House is not in session shall be filed with the Clerk of the House.

---

[From the Congressional Record, Sept. 11, 1959]

A WEST POINT FOR SCIENCE AND ENGINEERING

Extension of Remarks of Hon. Newell A. George of Kansas in the House of Representatives, Friday, September 11, 1959

Mr. GEORGE. Mr. Speaker, in three campaigns for Congress, I urged that emphasis be placed on the training of young people particularly in the field of science and engineering. The following is from a speech made in Overland Park, Kans., on August 9, 1956:

"We should offer scholarships for capable students or establish a West Point for Science and Engineering as soon as possible in order to train much needed scientists and engineers."

The Republican administration since taking office in 1953 has failed to grasp the importance of having sufficient trained scientists and engineers in order to maintain a strong and firm economy and national defense.

Today I am introducing a resolution which I trust will result in thorough consideration being given to the establishment of a U.S. Science and Engineering Academy. No better location for such an institution could be found than at Sunflower, Kans., where over 10,000 acres, many buildings and much equipment under control of the Army are now standing idle. An advanced academy of this type could be combined with one for foreign service training which would give special emphasis to foreign languages.

The Science Advisory Committee recently appointed by the President, while attempting to avoid statements which conflict with the policy of the present national administration, certainly took cognizance of the great need for training in the science, engineering and other fields.

Dr. Edward Teller and Vice Adm. H. G. Rickover and many other outstanding Americans have sounded the alarm that Communist Russia will far outdistance us in the education of our youth unless decisive action is taken immediately. Only by proper and adequate education can we maintain, or regain, our leadership in the field of science and foreign relations.

Before the advent of the first Russian sputnik an editorial written by Miss Helen E. Kohlenberg, editor, appeared in the Western Spirit, published at Paola, Miami County, Kans., on Thursday, June 28, 1956, and under leave to extend my remarks in the Record, I include Miss Kohlenberg's editorial.

"THE GEORGE PROPOSAL

"In his statement released at the time of filing as Democratic candidate for Congress from the Second District of Kansas, Newell A. George, Kansas City attorney, advocated the establishment of a "West Point" for science and engineering to provide the needed technically trained young people.

"This stems from a condition of which few Americans are cognizant. But recent statements by top administration officials to the effect that Russia holds superiority over America in certain lines of national defense are just cause for action along the lines of promoting science and engineering research and training. We train young people in other lines through scholarships and they enter the professions or industry. Hence, scholarships are not the answer.

"A West Point for science and engineering, established along the lines of the naval, Army, and air academies would serve to remove the shortage of scientists and engineers by providing an incentive to young people to enter those fields of endeavor, and young people thus trained would serve their country just as heroically as do the military.

"Need for immediate action is emphasized in the testimony of Gen. Earle E. Partridge before the Symington committee that Communist Russia is far advanced in the development of the intercontinental ballistic missile. Other testimony was to the effect that one thermonuclear (hydrogen) weapon could completely destroy one of our large cities and that Russia has the planes to deliver such weapons.

"George's suggestion that no better location for such an academy could be found than in the Second Kansas District fits into the picture of the movement by the Government, the military, and industry to midwestern locations.

"Mr. George's proposal for such an academy is the first that has come to our attention and we urge that it be given serious consideration."

Mr. ANFUSO. Thank you, Congressman George. I also want to congratulate you for introducing a similar bill. I am sure your people back home appreciate your efforts and the great record that you are building up here.

Mr. FULTON. I want to thank you on an excellent statement and on your civic outlook.

Mr. GEORGE. Thank you very much. Goodby.

Mr. ANFUSO. Any questions from any of the members?

Mr. GEORGE. I hope you will excuse me. I have people waiting.

Mr. ANFUSO. This morning we are also extremely honored to have Dr. Antonio Ferri here. Dr. Ferri is a noted scientist. He was born and educated in Italy and is a doctor of electrical engineering and a doctor of aerodynamics. He has been Privatdocent in aerodynamics, professor at Graduate School of Aeronautics, University of Rome, and director of the Supersonic Laboratory in Rome (first supersonic laboratory in the world).

He joined the underground in 1943. In 1944 he was brought to the United States by the Office of Strategic Services. There you and I, Dr. Ferri, and Judge Daddario have much in common. We all worked in the Office of Strategic Services. We know what you did to assist the allied cause and the people of Italy. Dr. Ferri later joined NACA, and became professor at the Polytechnic Institute of Brooklyn. There

again we meet on common ground. I come from Brooklyn. When did you come to this country, Dr. Ferri?

Dr. FERRI. I think in 1944.

Mr. DADDARIO. Brooklyn is in the United States.

Mr. ANFUSO. Brooklyn is the United States. There is a song written called "Brooklyn U.S.A." which I wrote.

Mr. FULTON. Off the record.

(Discussion off the record.)

Mr. ANFUSO. Dr. Ferri, you are presently head of the department of aeronautical engineering at Polytechnic Institute of Brooklyn, and director of the aerodynamic laboratory at the institute; a member of AGARD of NATO; a member of Scientific Advisory Board of the Air Force; a member of several panels for NASA, Air Force, Army, and Navy.

And recently we have been honored to have you join this committee as a consultant.

I note also that you have recently visited Russia. You were there in the month of February of this year as one of seven other distinguished scientists invited by the U.S.S.R. We are extremely honored to have you with us, Dr. Ferri. I hope that you can testify on this bill.

## STATEMENT OF DR. ANTONIO FERRI, HEAD, DEPARTMENT OF AERONAUTICAL ENGINEERING, POLYTECHNIC INSTITUTE OF BROOKLYN

Dr. FERRI. Thank you very much. Mr. Chairman and honorable members, I am not familiar with the procedure of this committee. However, I would like to express some of my ideas in connection with this bill. I believe that one of the major difficulties that we face at present in the United States in connection with the scientific work is the inability or lack of ability to develop and grow scientists able to do work in many fields of engineering and science in sufficient numbers to satisfy the need.

From this point of view I believe that the Russians are ahead of us because they have organized institutes where they can train large numbers of scientists having doctoral degrees to do basic research.

In my visit to Moscow the point that impressed me most was the fact that a large number of scientists, between 28 and 35, participated in the technical meetings presenting outstanding papers in the field of applied mechanics and fluid mechanics. These scientists are attached to the Academy of Russia. On this basis, the proposal to build an Academy of Science in the United States, with the function of developing scientists, appears to me to be a very valuable and a very important one.

It is my personal opinion that in order to increase the number of available scientists, we must try to train gifted students directly toward the doctor level, and use them for postdoctoral work. We have enough organizations in the country able to train students through the sequence of bachelor's degree, master's degree, and doctor's degree.

Large progress could be made by selecting a small number of very outstanding young students and training them directly toward the doctoral level. However, it is necessary that after the doctoral degree

they be able to work in some institute where they can do research in their field on a permanent basis.

At the present time many of the research organizations in this country are either Government organizations like NASA or are attached to universities. However, these organizations are not in a position to train a large group of young scientists, and therefore their effort in this field is somewhat limited.

I believe that an organization like a national academy could really overcome this difficulty, and with a direct collaboration with the universities could reduce this problem by a very large extent.

Mr. ANFUSO. Dr. Ferri, I would like to ask you this question. Perhaps I ought to begin by asking you not to be too modest. Would you mind telling us for the record what has been your training and experience in science and scientific education?

Dr. FERRI. I had 8 years of primary schools. After I had 6 years of college for my doctor's degree in electrical engineering, and then I had 2 more years of college for my doctor's degree in aerodynamics. I worked in research at the university for many years, about 7 years. I worked in an institute of research that was designed essentially for high-speed aerodynamics. I had available for my work a supersonic wind tunnel in 1935, and this was the first large-scale supersonic wind tunnel in the world.

Around this facility we built a research group that was very successful in the field of aerodynamics.

I came to the United States and I continued in my profession in the same field. At the present time, I have working with me a small group of research scientists that has contributed to the field of very high-speed aerodynamics and is well known all around the world.

Mr. ANFUSO. We are certainly honored to have you as a consultant. We owe a debt of gratitude also to Mr. Andrew Haley, who is present here. He is general counsel of the International Astronautical Federation, through whose invitation I attend the London Conference, and who recommended you. This committee thinks very highly of the recommendation of Mr. Haley. I know that his opinion has been justified.

In your opinion, Dr. Ferri, is there a shortage of engineers in the United States, and scientists?

Dr. FERRI. There is a shortage of engineers. However, I believe the largest shortage is of very well-trained scientists. There is a shortage of people with the doctor's degree in the field of engineering, physics, chemistry. And there is a large shortage of people trained to do research beyond the doctoral degree.

At present, all the students, who obtain a doctoral degree receive very attractive offers from industry, and therefore they usually go into industry. This implies that there is a very small number of doctoral candidates that are continuing their research work, especially in the field of basic research.

At the same time, a mechanism to do work in a field of pure research does not exist because there is no organized system for supporting these candidates in large numbers. The few Government organizations that can support such work are NASA, ONR, OSR, ORO, et cetera. But their support is not a continuing support, and is for research only and not for training.

Mr. ANFUSO. Dr. Ferri, one of the provisions of H.R. 4986 is section 7 of the bill, subdivision (A), which states—

that upon designation by the President, the Director of the Academy—

that is on page 4—

may permit persons who are citizens or nationals of foreign states friendly to the United States to receive instruction at the Academy. Not more than 75 persons may receive instruction at the Academy under this section at any one time.

Do you care to comment on that?

Dr. FERRI. I believe that this will be a very good way to train foreign people, especially from Europe. At the present time an activity of this kind is sponsored in Europe by AGARD. AGARD brings here each year on the order of 10 students or scientists to get training in the United States. This activity achieves important results. It is an advantage to the students, and at the same time provides a mechanism for explaining our way of working, and therefore eliminates some misconceptions that exist around the world.

Mr. ANFUSO. In addition, I think, the United States provides the greatest facilities for a good education in this field of science and engineering. We do have foreign students who show an aptitude for science but who in their own country could never receive such an education. For example, Japan is on the verge of producing some very fine scientists, and I have heard would welcome sending some students here for further scientific education.

Dr. FERRI. This is absolutely correct. In fact, Japanese universities have asked several universities around the United States to accept their students to get their graduate training in our institutions. For example, my institute has had in past years for a period of time students who had obtained their degrees in Japan. This activity, however, proceeds through personal contacts, and is not done in an organized form.

The Academy could do it in a much better way.

Mr. ANFUSO. What is your opinion regarding other provisions of the bill, for example, that it is not restricted to the male sex, that it permits females?

Dr. FERRI. I believe this is natural.

Mr. ANFUSO. In the field of science it is natural?

Dr. FERRI. In the field of science the female sex can contribute as much as the male sex. In the Science Academy in Moscow a large percentage of members are of the female sex.

Mr. ANFUSO. In the U.S.S.R.?

Dr. FERRI. Yes.

Mr. ANFUSO. What is your opinion about the clause in the bill that no physical requirements shall bar any male or female from entering the Academy?

Dr. FERRI. I believe this is very fundamental. There are many well-known scientists with physical handicaps. I think a physical handicap would not stop anyone from doing scientific work.

Mr. ANFUSO. Doctor, I remember your telling me that in the U.S.S.R. there is a very good science academy which is not limited to just training or teaching students, but also carries on vast research. Is that correct?

Dr. FERRI. That is correct. They have several institutes of the academy spread all around Russia, and they do research work. They have permanent groups of scientists supported by the Government to do basic research.

This is one of their major sources of research work. The institutes are spread around the country, often located close to technical colleges. Sometimes some members of the academy are professors at the university. The academy has the responsibility of supporting and stimulating their work and in some ways directing their work.

Mr. ANFUSO. Is it your opinion that if we do establish the Science Academy we should also provide for research, so that scientists can continue their research there and students who graduate can continue their postgraduate work?

Dr. FERRI. I believe this will be one of the major contributions of the Academy, the possibility to have doctors continue in research and contribute to research.

Mr. ANFUSO. I might state at this time that Dr. Glennan, who is Administrator of NASA, agrees with you entirely in that respect.

What do you think the curriculum and method of operation of this Academy should be?

Dr. FERRI. I believe that the way of training people of this Academy must be different from the way of training people at the Military, Naval or Air Force Academy.

The military academies have a very specific function for their training. A scientific type of academy has a large and broad responsibility in many different fields of science. For example, they must train in medicine, biology and engineering, physical and mathematical sciences.

I believe that the function of the Academy would be to organize an advanced type of curriculum for these students, and take advantage of some of the existing organizations in order to train these students. For example, it is my feeling that it would be possible to obtain a doctor's degree with a curriculum that would take about 6 years, if we plan to train the students directly for a doctoral degree. If we start from the freshman year, going through 6 years of training, it will be possible to carry the students to a doctoral level.

This would mean that we could save in the production of doctors 2 or 3 years for each candidate. This also will make it possible to select many good students, because they will be attracted by a 6-year curriculum. At the same time it will be possible with financial support to put these students through a stringent curriculum, extended through the summer. I think this could be an important contribution to training of a large number of students for advanced work.

Mr. ANFUSO. While you are on that subject, Dr. Ferri, would you please compare United States and Soviet education in science and engineering? Tell us about the method of training, scientific institutes, and the number of engineering graduates.

Dr. FERRI. This is somewhat a difficult question for me to answer. I am not completely familiar with their system of education. I know, however, that their system of education is much more specialized than ours. They select a fairly small field of interest and they become acquainted with this field very, very fast and very deeply. Thus they can produce very effectively in a much shorter time than we can.

60555—60——3

However, I am not sure that system will pay off in the long run, in the sense that their scientists will grow somewhat narrow in knowledge. Therefore, they will not be able to supervise very complex projects where a large field of knowledge is required.

Mr. ANFUSO. I might add to that, Dr. Ferri, that the U.S.S.R. even pays the students who attend their institutions of higher learning, and pays them a pretty good salary. That is a tremendous advantage, because the students don't have to take summer jobs in order to make both ends meet.

In other words, the financial worry is eliminated so that these young men and young women in Russia can devote their full time to their studies.

Do you approve of such a system?

Dr. FERRI. I believe it is a very efficient way to produce good scientists in the shortest time possible. I believe, also, that it is economically sound; a student could graduate in the shortest period of time, and after graduation could produce about 10 times as much as he could do in the 3-month summer job. At the same time, he would remain attached to the school without interruptions; this also would be good from many practical points of view.

Mr. ANFUSO. I gather, then, that you approve of the general provisions of H.R. 4986?

Dr. FERRI. I am very much in favor of it.

Mr. ANFUSO. Thank you very much, Mr. Fulton.

Mr. FULTON. Do you think there should be a science academy added then?

Mr. ANFUSO. Mr. Fulton is one of the most distinguished members of this committee, and he likewise introduced a bill providing for a science academy.

Mr. FULTON. Do you think that a science academy should then be established?

Dr. FERRI. I think so.

Mr. FULTON. Do you think it would be a matter of major benefit to the U.S. scientific community if this is established, or will there be sufficient facilities otherwise without establishing this Academy?

Dr. FERRI. I believe if the Academy is organized in such a way that it will take advantage of activities already existing in many fields at universities or Government organizations, it will contribute strongly to the progress of science.

Mr. FULTON. To expand the base of scientific education in this country. And it will help the United States in its advance in science?

Dr. FERRI. I think so.

Mr. FULTON. Thank you very much.

Mr. ANFUSO. Mr. Daddario—"Judge," I should say—a very distinguished member of the committee.

Mr. DADDARIO. It is a pleasure to have you here. I have been very interested in what you have had to say, especially because of the fact that you, in the program that you conducted in Italy many years ago, showed what could be done through adequate research and through the adequate support of the Government in channelizing research. The abilities of Italy in the field of flight during those days were astounding and remarkable.

I have been struck by one thing in what you said: As I understand it, you believe we have sufficient competence at the lower levels—

through the bachelor degrees—and that our efforts ought to be directed at greater utilization of our better people after that stage of the game, and that if there is work to be done it should be done here, in training students not only at the doctoral level but at the postdoctoral level, bringing them together afterward on a permanent basis to work on research programs. Is it your idea, then, that if a national science academy is founded it ought to be a postgraduate academy rather than one at the bachelor level like the military academies now in existence?

Dr. FERRI. It is my opinion that if some additional training must be done in the undergraduate level, it must be different from the training done at present at the universities. I would suggest that we consider a curriculum that starts from high school and goes through to the doctoral level in the shortest time. This could be done by working in cooperation with selected colleges, by introducing special programs, and with a few additional courses given at the Academy.

The major effort of the Academy must be in training the postdoctoral student specifically for research work. In this field we don't have any large-scale effort, and we don't have any real organized support. Therefore, the organization of institutes for research attached to the Academy are the more interesting from my point of view.

Mr. DADDARIO. There are now in some cases coordinated programs where some of our liberal arts schools and some of our technical schools get together so that over a 5-year period, 3 years in the liberal arts schools and 2 years at the technical schools, some of the students can combine activities, and get a B.A. and a B.S. degree. This kind of program gives them the opportunity to work from the one stage to the other. Is it your idea that we ought to have this kind of coordination, with a national science academy taking students from, say, the liberal arts schools, so they could get their basic work for 3 years and then come to the National Science Academy for their doctorates?

If so, how would the program be coordinated, and how many years would it take? Would the National Science Academy, if we follow that suggestion, be a 4-year course or 2- or 3-year course?

Dr. FERRI. What I had in mind is somewhat different.

I believe that first the training must be organized having in mind that the major product would be doctoral training. So we must start at the first year toward a doctoral degree. This curriculum will not be organized in three steps as now, bachelor, master, and doctor. This approach introduces a waste of time because you must give the same topic at the bachelor, master, and doctoral level. This is inefficient.

It is my feeling that we must try to introduce a program that starts with the idea that the candidate will go through training for 6 or 7 years toward the doctoral level. This implies that the candidates must be selected very carefully and must be a fairly small percentage of the high school graduates. They must go through a training program that is a very complete one in sciences and arts. A large part of the training in sciences must be done in specialized existing universities.

Only part of the training could be done at the Academy. However, the Academy must organize the program in cooperation with some selected universities, must organize the selection of the students, must organize their financial support. The Academy could organ-

ize the training in liberal arts, politics, economics, language. At the same time it must guarantee that the curriculum given is the curriculum planned, and must therefore supervise the training.

When the student gets his doctoral degree, the Academy must take care that he is directed to a field of research and that he can work. The Academy must organize the institutes to perform work in the field of research.

Mr. DADDARIO. There would have to be a program that would tie together the research work which these people would participate in after graduation.

Dr. FERRI. Yes, I believe that this is very important.

Mr. DADDARIO. One problem, and I have discussed this with the chairman of this committee on occasion, is how we work out a program through which these men, after graduation, would remain in the Government. There are no arrangements comparable to those made by the Army or the Navy for having them stay in for a certain period of time after graduation.

How would we insure that the benefits would inure to the Government?

Dr. FERRI. It is my feeling that the provision in the bill is satisfactory. The only point I suggest changing is the place where the training is done; that the training be planned in several physical locations at different colleges where this training could be given.

For example, recruiting along the lines suggested in the bill is absolutely satisfactory. The way to support the trainee is absolutely satisfactory. My only comment is that to give a complete curriculum in many different fields of science in one single location is difficult; therefore we must consider that some part of the curriculum, a small part, or better a large part, depending on the training, be given at a location where this curriculum can be given easily. Consider, for example, the training in the engineering field. That is my field. You want to create scientists in the field of electricity. Part of the curriculum could be directly supervised by the Academy. Another part, however—4 years, 1 year, 2 semesters—could be given in some other location not directly under the supervision of the Academy. This could be at MIT, at our college or at some other university where you already have a specialized group of professors that can give adequate training. The curriculum given in the Academy could be different from the regular curriculum in many aspects. For example, it is a 6-year curriculum for a doctoral degree.

After graduation, the trainees agree to work for the Government for 5 years. This requirement can still be valid. In this way it is not necessary to build a new educational system attached to the Academy, by taking advantage of the existing ability of the universities to give high-caliber technical training.

This, in my opinion, would simplify the problem.

Mr. DADDARIO. Thank you, Mr. Chairman.

Mr. ANFUSO. In other words, in addition to what you have said, you approve of section 8 of the bill?

Dr. FERRI. Yes. Absolutely.

Mr. ANFUSO. Mr. King?

Mr. KING. I have nothing right now.

Mr. ANFUSO. Thank you very much, Dr. Ferri.

I would like to introduce for the record a statement from the Honorable Katharine St. George, a very distinguished Member of Congress from the great State of New York.

She introduced, at my suggestion, a similar bill as far back as 3 years ago. In this Congress she also introduced H.R. 3921, which follows the pattern of the bill under discussion, H.R. 4986.

Without objection, I offer the statement of Congresswoman St. George for the record.

(The statement follows:)

Mr. Chairman, I have reintroduced H.R. 3921 in the form of a new bill, with the active cosponsorship of Congressman Victor L. Anfuso, chairman of this subcommittee.

This new bill provides that young men and women, between the ages of 17 and 25, may be nominated as candidates for appointment to the Science Academy by the President or by Members of Congress.

Final appointments would be made on the basis of qualifying examinations as prescribed and supervised by the National Science Foundation. The accepted students would receive a 4-year course of study, at Government expense, in which they would be trained in science, engineering, and related fields.

Upon completion of the course, the science trainees would be required to serve at least 5 years as science officers or employees of the United States, either with the Armed Forces or as civilian scientists and technicians with the Government in careers devoted primarily to the security of the United States.

If this bill is reported favorably, I will offer two amendments.

First, to strike out section 7(a), lines 16 to 21, inclusive, of page 4;

Second, to strike out section 7(e), lines 17 to 19, inclusive, of page 5; and to renumber the section accordingly.

I would never wish to be a party to having a student specifically instructed not to subscribe to an oath of allegiance to the Government of the United States, and this is my reason for the amendments.

However, I feel that this matter can be taken care of at a later date, and as I am extremely interested in the passage of the legislation, I will leave H.R. 3921 before the committee in its present form.

Mr. ANFUSO. Similarly, I would like to introduce into the record a statement from the Honorable George M. Wallhauser, a Representative from the State of New Jersey. He favors the passage of H.R. 4986, and offers some very valuable suggestions in his statement.

(The prepared statement of Mr. Wallhauser follows:)

Mr. Chairman and members of the committee, I want to express my deep appreciation to you for granting me this opportunity to express my views on a problem that I believe requires serious study and eventual action. I refer to the establishment of a U.S. Science Academy.

I congratulate the committee for its foresight in considering the matter before it by holding hearings on H.R. 4986, a bill to establish a science academy, introduced by Mr. Anfuso.

I am one who is convinced that there is a great need for trained scientists and engineers in Government service, whether it be in the Department of Defense or in other departments. Our Post Office and Civil Service Committee has received many requests for additional supergrades to employ trained scientists.

My belief in this need prompted me to introduce H.R. 10072, which is a bill to provide for the establishment of a Commission on the U.S. Science Academy.

I have no pride of authorship but believe that certain features of my bill are worthy of your attention. My bill differs in several important respects from others that have been introduced on the subject.

The specifics that I have proposed are contained in H.R. 10072, but I would like to point out that it does not provide for the direct establishment of a U.S. Science Academy. Instead, it proposes the creation of a 12-member Hoover-type commission, 6 of whose members would have to be prominent in the field of physical sciences, mathematics, or engineering, to evaluate the feasibility and need for establishment of such an Academy. It appears to me that is the correct and proper approach in a matter of such vast importance.

Also, my bill conceives that the Academy, if established, would train and assist unusually qualified students, who have completed their college training, in the fields of physical science, mathematics, or engineering, and whose services would be retained by our Government for a specified number of years after graduation.

It is my belief that the graduates of such an Academy, if established, could assist materially in progressing toward not only a more secure life for our people, but also for one containing as many human comforts as possible.

In testifying, I am not unmindful that your committee has before it reports from two agencies rejecting the proposal contained in my bill, and the others that have been introduced on the subject.

I do not in any way challenge the knowledge or intentions of those from these agencies who have written the reports. However, I cannot agree with their conclusions. Highly specialized courses and studies at graduate levels are required, I believe.

Would it be harmful to the American people to carry out the study proposed in my bill? My answer is a strong no. In fact, it might be harmful to the future of our Nation and its people not to direct that such a study be conducted.

It may well be that the comprehensive study that I have proposed will prove there is no need for the establishment of a U.S. Science Academy. On the other hand, it might well prove conclusively that such an Academy should be established. I respectfully suggest that now is the time to initiate the study that could be used as an authentic base for making a final determination.

Because a few disagree with the proposal for a study, should we in Congress gamble on what is the right decision? I strongly urge that this committee start toward the road to enactment of legislation that will direct a study of the proposition that a U.S. Science Academy be established.

Mr. ANFUSO. I think that completes our witnesses for today. May I ask Mr. Beresford when the next hearing will be?

Mr. BERESFORD. Mr. Chairman, we have the date of May 25 for the next hearing of the subcommittee.

Mr. ANFUSO. What day of the week?

Mr. BERESFORD. That is Wednesday, I think.

Mr. ANFUSO. It is either Wednesday or Thursday.

Mr. BERESFORD. I am pretty sure it is Wednesday.

Mr. ANFUSO. I wish you could induce Mr. Haley to make a statement either at that meeting or some future time. The committee is working very diligently on this bill in a nonpartisan manner. We hope to get unanimity, and thus far in this committee we have unanimity on every report we have issued. This is only the first meeting. I don't think we will be ready to report the bill in this session of Congress. We will probably be able to report it in the next Congress. There are many things that have to be done, many witnesses to be heard—including some adverse witnesses—many subjects to be considered, such as costs and curriculum.

We will have to explore the whole situation by visiting some institutions. I understand some foreign countries have science academies. And before we can report a bill, I think this committee should be fully acquainted with what other countries are doing in this respect. We are authorized to conduct these investigations and to report a bill when ready. With that, if there is no other business, no other comment of any member, this meeting will stand adjourned.

(Whereupon, at 11:10 a.m., the subcommittee was adjourned.)

# A BILL TO PROVIDE FOR THE ESTABLISHMENT, UNDER THE NATIONAL SCIENCE FOUNDATION, OF A NATIONAL SCIENCE ACADEMY

---

**WEDNESDAY, MAY 25, 1960**

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE NO. 3,
*Washington, D.C.*

The subcommittee met at 10:30 a.m., Hon. Victor Anfuso (chairman of the subcommittee) presiding.

Mr. ANFUSO. The hearing will be in order.

Gentlemen, this morning we continue our hearings on H.R. 4986 to provide for the establishment of a National Science Academy.

This morning we are privileged to have as a witness Rear Adm. Charles Horne, Retired, who is vice president of Convair and general manager of its Pomona division. He is also president of the Southern California Industry Education Council, a nonprofit organization. He is also vice president of the Los Angeles Chamber of Commerce and is a fellow of the Institute of Radio Engineers.

Admiral Horne comes here this morning from California, and I am happy to state at his own expense—at no expense to the Government.

Admiral Horne, I understand you have a prepared statement. Would you care to give that statement first, and then we will ask you some questions?

## STATEMENT OF CHARLES F. HORNE, VICE PRESIDENT, CONVAIR AIRCRAFT

Mr. HORNE. Thank you, Mr. Congressman.

It is a sincere pleasure and honor to meet with this committee again and to discuss ways and means of improving the educational opportunities for the youth of our Nation.

As you may recall, I was privileged to appear before you just 1 year ago. At that time I outlined the program of the Southern California Industry Education Council. I indicated that its purpose is to motivate our young people to secure a more meaningful education, especially in science, mathematics, and engineering. Further, I stated that one of the objectives of the organization was to assist schools in providing the educational base needed in this technological space age.

I would like to report parenthetically that the council's program is continuing to grow and is showing positive results. For example, overall enrollment in the Los Angeles City schools in grades 9–12 has

increased 61.5 percent in the past 9 years. At the same time, enrollment in science classes has increased 89.7 percent, and the increase in mathematics has been 128.4 percent. The greatest increase has taken place in the past 3 years. Comparable increases also can be found in other areas of southern California. I cannot say that the Southern California Industry Education Council program has been solely responsible for this new interest in science and mathematics. However, we do know that the council-sponsored science fairs and lecture-demonstration teams, council-encouraged summer employment of teachers and students, as well as other programs, have materially aided in the overall growth in interest in science and mathematics.

As an industrialist, a father, a former naval officer—and as an American citizen—I am vitally interested in the education of our youth. This is why I devote my time and energy to the Southern California Industry Education Council program. This is why I am interested in every worthwhile program that will motivate our young people and will provide them with outstanding educational opportunities. Also, this is why I am happy to present my personal views to you on the subject of the proposed Science Academy.

As an industrialist, I am well aware of the shortage of well-qualified scientists and engineers. Many agencies, such as the Engineers' Joint Council, U.S. Bureau of Labor Statistics, and the Scientific Manpower Commission, give us annual statistics on this problem. While they do not all agree on actual figures, it is the general consensus that industry, the Government, and the teaching profession need some 10,000 more scientists and engineers per year than our schools are presently graduating. For the past 2 years, enrollments in these fields have been decreasing.

Another disturbing factor is the tragic loss between the high school and college year of young people who have the talent to be successful in science and engineering. According to Charles C. Cole, Jr., of Columbia University:

> In 1955 between 60,000 and 100,000 high school graduates of college ability failed to enroll in college for financial reasons, and perhaps an additional 100,000 did not enter college because of lack of interest.

From all information available to me, this problem has not decreased in the past 5 years.

I believe our manpower shortage in science and engineering can be overcome if we attract, motivate, and assist these capable students to pursue a higher education. To do this will take the combined efforts of our entire community—the home, schools, industry, and business, the State and the Nation. The proposed Science Academy certainly would be one way in which the Federal Government could provide needed motivation.

Personally, I believe some type of science academy would be worthwhile. I cannot speak for all the educators and industrialists in the Southern California Industry Education Council, because I have not had an opportunity to discuss the subject fully with all of them.

Quite frankly, we have had mixed feelings about such a project in the discussions we have had. However, there is one point upon which we all agree. If a Science Academy is established, it should be on the graduate level and not on the undergraduate level. Our reasons for this are:

1. An undergraduate academy would simply add one more school that would be accomplishing the same thing that our private and State colleges and universities are now doing. The addition of one more college would not materially offset the overall shortage of trained personnel. Our Government has established and now maintains our service academies because there is a specific professional need to train men in military science. The situation is not analogous in the fields of science and engineering. New schools are being created to provide education in science and engineering.

For instance, two colleges, California State Polytechnic College and Harvey Mudd College, have been opened in the Pomona, Calif., area in the past 4 years. Practically all colleges and universities are capable of expanding their facilities in science and engineering.

2. An undergraduate academy would not be able to specialize in science, mathematics, and engineering fields as completely as would a graduate level academy. The curricular in an undergraduate academy would have to include all the general undergraduate subjects such as the humanities and social sciences that should be required in all undergraduate programs. These subjects are necessary to the well-rounded individual. However, if the Academy were established on the graduate level, the students would have already met these necessary requirements. The graduate student could concentrate his attention on the major fields of science and engineering specialization.

3. A student graduating from the graduate Academy with a master of science or Ph. D. degree would be better qualified to enter his chosen profession. If he were to complete a study course from an undergraduate academy, he would in many cases wish to continue working on advanced degrees. He might be denied the chance to pursue his all-important graduate study until his mandatory 5 years of service had been completed. In science and engineering we find that graduate level is becoming an absolute must in many fields, because the complexities of our new technological era demand this advanced study.

4. Selection of personnel to attend a graduate academy would be much more effective. Not only would competitive examinations be used, but also a 4-year undergraduate academic background could be tapped for evaluation purposes. Also, the caliber of students would be superior. These students would be more mature, would have a better understanding of what they wanted to do, and would be capable of accepting and accomplishing a higher degree of study than would the younger undergraduate.

5. The greatest need today is for better qualified men. Graduates with advanced training and degrees could help solve this problem. Dr. Howard Meyerhoff, Executive Director of the Scientific Manpower Commission, has pointed out that the number of doctoral degrees in natural sciences, almost a prerequisite for research work, is far below the demand. Dr. Joseph Platt, president of Harvey Mudd College, Claremont, Calif., indicates that only 1½ percent of today's engineers go on to secure a Ph. D. The Science Academy could assist materially by providing graduates at the Ph. D. level for teaching, for Government research, for industry.

6. Many colleges today do not offer advanced degrees, because they do not have the funds available to establish graduate programs. The added costs of increased faculty, well-stocked libraries and equipment

needed for advanced study and research often are prohibitive. A graduate-level Science Academy would help alleviate this problem.

If this committee should decide that a graduate level academy is not feasible or desirable and that assistance should be given only on the undergraduate level, I would recommend that an academy not be established.

If you wish to move into an undergraduate program, I would recommend that a scholarship plan similar to the U.S. Navy's contract plan be established. Under such a plan qualified students would be selected under the same plan now proposed for the academy. Selectees would be enrolled in specified colleges with full scholarship and a nominal monthly subsistence allowance. Summer vacations would be spent working on research projects as assistants or technicians in industry, or in Government laboratories. Students would gain much valuable practical experience which would broaden their attitude toward the application of scientific knowledge.

If a graduate academy is established, I would recommend that provision be made to have a number of rotating faculty appointments. Outstanding scientists and engineers could be brought in to teach for a year, for a semester, or to conduct special seminars. Under such a plan the Academy would have little chance of becoming stagnant in its pedagogical methodology. New ideas constantly would be infused into the curriculum.

Naturally, a continuity of faculty would have to be maintained. Therefore, I would recommend that 30 percent of the faculty be on the rotational plan during the academic year.

There are three areas in which I feel extreme caution must be exercised if such an academy is established:

1. Some provision must be made to keep the Academy nonpolitical. An academy of this stature will not be effective if its objectives and goals ever are challenged by political pressure.

2. The Academy must not be allowed to become the tool of any pressure or special interest group. The academic pursuits of the Academy must never be confined to a narrow channel. The Academy must have the freedom to move with the times and, if possible, to be ahead of its times.

3. Provision must be made to insure that the establishment of a graduate-level academy will not be in conflict with governmental aid now being given to private and State colleges and universities. Many colleges and universities now are able to maintain graduate and research programs only because they receive Government, industrial, and foundation aid for research projects. If the establishment of the Science Academy would require these programs to be discontinued, or in any way would jeopardize these all-important programs, the overall effect of an academy would be negative rather than positive.

In conclusion, I would like to restate that I personally believe a Science Academy would be a positive motivating force and an aid to provide scientific and engineering education to our Nation's youth. To meet this objective, the Academy must be established on the graduate level.

I sincerely thank you for the opportunity to express my views on this subject.

In summary, Mr. Chairman, as you gentlemen will recall, I had the pleasure of appearing before the committee about a year ago to

tell of the actions and growth of the Southern California Industry Education Council. I indicated at that time that the purpose of this council is for industry and educators to get together cooperatively to assist each other in motivating our young people to secure a more meaningful education, particularly in science, mathematics, and engineering.

I stated that one of the objectives of this organization is to assist our schools in providing the educational base needed in this technological space age that we find ourselves growing into so rapidly.

I would like to report to you parenthetically that this Southern California Industry Education Council program is continuing to grow and it is continuing to show, I believe, some pretty good results.

For example, I think you might be interested to know that the overall enrollment in the Los Angeles city schools in grades 9 through 12 has increased 61.5 percent in the past 9 years, but at the same time the enrollment in science classes has increased over 88 percent and the increase in mathematics is 128 percent.

Now, the greatest of these increases in the science and mathematics enrollments has taken place in the last 3 years and comparable increases can be found in other areas of southern California. Naturally I cannot say or prove to you gentlemen that this has been caused by this industry education council, but it certainly is significant that it is coincidental. At any rate, the council has sponsored the science fairs, all the science fairs, all of the lecture demonstration teams, special counseling for teachers and students, summer employment for teachers and students and many programs that we have worked out together cooperatively to promote the overall growth and interest of our kids in these matters.

Naturally, I have tremendous interest in these matters as a citizen and as a grandfather and as a man who is responsible for some of our industrial effort in the missile field, so I do what I can to understand some of these matters.

When I heard of the bill that has been introduced, H.R. 4986, and received a copy from you, I studied it carefully. I discussed it with a number of my friends and colleagues in the southern California area, and, while the views that I present today obviously are my personal views, nevertheless, these personal views have been acquired by discussion with many people, and therefore in my judgment represent a consensus of those things which many of us did agree to.

Now, I am well aware as an industrialist of a real shortage in well qualified—well qualified, I emphasize—engineers and scientists. I think many agencies such as the Engineers Joint Council, U.S. Bureau of Labor Statistics, the Scientific Manpower Commission, have many statistics on this problem. I would not attempt to quote them. They don't all agree on the actual figures, but there certainly is a consensus of opinion that Government, industry, the teaching profession, need many more scientists and engineers per year than our schools are presently graduating.

For the past several years, enrollments in the fields of science and engineering percentagewise have been decreasing rather than increasing. This is a very serious problem. I think, therefore, that the basic purpose of the bill I came to talk about is a very excellent one.

I am in hearty agreement that something needs to be done. This bill looks like a really good initial step in the right direction. I think

it is a fine thing that something of this nature has come up, is to be introduced, and is being discussed; and I am sure the testimony and opinions of many people will guide you gentlemen in seeing just what is necessary to be done in the future.

It is interesting to note that there is a need for some method of getting more of our capable young people into undergraduate institutions. Now, many good things have been done. There are many loan plans, the National Science Foundation plan, many private loan plans, many private scholarship plans, but we are still not getting all the youngsters who are capable. They need to be motivated, and then they need to be helped.

I believe we can do a great deal more about this problem, and I am convinced that some type of science academy would be a very worthwhile thing.

As I discussed this subject with many of my friends, who have many divergent opinions, there was one significant point upon which there was general agreement and that is this:

The Science Academy, many of us feel, should be established on the graduate level rather than on the undergraduate level.

Now, this does not mean that we do not need additional undergraduates taking courses in science and engineering, but any undergraduate must have a thorough grounding in the humanities, in the social sciences, and so in a 4-year undergraduate course there is little that you can add in the way of curriculum to the science and engineering knowledge than is already being given in many undergraduate institutions. Therefore, I would recommend that—rather than establishing another undergraduate institution—the number of undergraduates be increased at existing institutions by a contract scholarship plan similar to what the military services are already doing, whereby a deserving young man or young woman who has done appropriate things and passed appropriate examinations can be under contract to the Government while taking undergraduate courses at existing colleges and then be obligated to serve the Government for so many years in repayment after graduation.

This is very similar to a number of the military service reserve officer plans, and you are talking about the same general caliber of students and the same general caliber of people.

Now, if this were done, it would be a much quicker and I think probably just as efficient and probably less expensive way to materially increase the output of undergraduates with B.S. degrees, for example, and I am sure that a number of youngsters would be happy to take such a course under contract and obligate themselves to serve with the United States for a given number of years in repayment therefor, as they are already doing.

The establishment of a graduate Science Academy, on the other hand, would be a tremendous thing, a wonderful thing, a most necessary thing, because what we need so greatly these days is more highly qualified scientists and engineers. The number of scientists and engineers we have today is inadequate, but the quality needs raising even more than the quantity.

Dr. Joseph Platt, who is the president of the Harvey Mudd College, a new one established in Claremont solely for the purpose of training high I.Q. youngsters in science and engineering, has stated that in

his judgment perhaps only 1½ percent of today's engineers go on to secure Ph. D.'s.

I don't think we can take these figures in preference to any other figures; but, in a general way, there is considerable evidence that the number of youngsters who go beyond the B.S. degree to get either a master's degree or a Ph. D. degree is much too small. Here is where the financial bind really hurts.

People could go to a National Science Academy, and get this type of superior graduate training, and then obligate themselves to serve the Government. I think such graduates, with a Ph. D. and special training, would be of tremendous value to the Government, either in Government service or as additional teachers and things of that nature.

I would like to point out three areas in which I think real caution should be exercised. I am sure you have considered all of this, but just for the sake of the record I would like to state my opinion also.

First, I believe it is most essential that any such academy should be kept nonpolitical. An academy of this stature would not be effective if its effectiveness were challenged by political pressures of any kind. It must not be allowed to become the tool of any pressure or special interest group.

Secondly, any such academy has got to be for the entire United States and for the benefit of all the people of the United States, and so I think the academic pursuits of the Academy cannot be confined to a narrow channel. They must be broad, as they should be, to encompass all fields of science and engineering.

The Academy must have the freedom to move with the times, and, if possible, it should be ahead of the times in all respects.

Now, thirdly, I feel that provision must be made to insure that the establishment of a graduate-level academy will not be in conflict with the governmental aid which is now being given to private and State colleges and universities. This is a very important aid which is already going on. Many of our colleges and universities now are able to maintain graduate and research programs only because they receive Government, industrial, or other types of financial assistance. If the establishment of the Science Academy would require any of these programs to be discontinued, or in any way reduced or jeopardized, I think this would be most unfortunate, because the good work that is going on now in our various colleges and universities—the graduate work which is already going on, the research work that is going on—is tremendous and vital to us.

Much of our basic research which is so essential to the progress of this country is now going on at our existing colleges and universities because of the assistance and encouragement given by the Government at the present time, as well as by private foundations and so on.

In short, I personally believe that a science academy would be a very positive, a very fine motivating force to add to and to provide the scientific and engineering education which we so urgently need to increase; and to meet this objective, if the Academy were established on the graduate level, I think it would be of tremendous value.

Mr. ANFUSO. Thank you very much, Admiral.

As I understand your testimony, you are in favor of the National Science Academy, but you want to limit it to a graduate level. Is that correct?

Mr. HORNE. I think it would be more valuable at the graduate than the undergraduate level and would fill a tremendous urgent need at the graduate level.

Mr. ANFUSO. While my mind is not closed on that subject, I want to say that I see a great deal of merit in your proposal, for the simple reason that we are engaged in a race with the Russians. If the Academy were established at an undergraduate level, it would take years before we could see results. By establishing it on a graduate level, we could almost immediately see results by getting those graduates today who have shown a great deal of promise and who will make good use of the great research center you propose to have at this Academy. I think then we can arrive more quickly at results that will be more beneficial. Do you agree with that?

Mr. HORNE. Sir, I agree with that most heartily.

Mr. ANFUSO. In your opinion, could a national science academy combined with a scientific career service provide the needed additional motivation as well as financial support for young Americans to pursue careers in science and engineering?

Mr. HORNE. I think it would help a great deal.

Mr. ANFUSO. We had a witness before our committee by the name of Dr. Ferri, whom I think you know. He recommended an integrated straight-line curriculum leading directly to a doctorate. Do you agree with that?

Mr. HORNE. Yes, I think a good straight-line curriculum leading to a doctorate would be a very fine thing.

Mr. ANFUSO. He stated that such a program would avoid the considerable duplication and waste of time involved in our present system of training. Is that also your opinion?

Mr. HORNE. Yes, sir. This would be a very helpful thing.

May I point out in addition, at this point, that the motivation to take effective graduate work has to be high in the person who attempts it. With a little experience, either in Government service or civilian life, or in the military services, many of our youngsters find themselves much better prepared and much more strongly motivated to know really what they want to do. I feel that many times some practical experience is very helpful prior to graduate training.

Mr. ANFUSO. Might I also state, Admiral, that while the present bill does not provide for research facilities, after talking with Dr. Glennan, Dr. Ferri, and others, I intend to amend the bill in due time to provide for a very well equipped research center in the Academy.

Mr. HORNE. This is a very fine thought, sir.

Mr. ANFUSO. Do you think that such a research center would help in getting a first-rate faculty?

Mr. HORNE. Yes, sir, I do.

Migh I say a word about the faculty for such an institution? I think it would be very desirable to have some of the faculty present over a long period of time for continuity, but even more desirable to have quite a high percentage of the faculty on a rotational basis, so that you could have outstanding men from Government or industry

come and teach at the Academy for a year or two. This would furnish the new thought, the up-to-the-moment ideas, which would be so valuable for such an academy. A combination of a relatively permanent staff, plus a rotating, changing staff, would be a good thing, in my judgment.

Mr. ANFUSO. In your opinion, Admiral, should the scientific career service be opened to graduates of other institutions than the National Science Academy?

Mr. HORNE. I think it would be most essential, sir. In these days, there is provision for men and women of any accredited school who have taken a proper course to become part of almost any of our career services. All our military services have means by which graduates of the State universities and the private universities can become members of a career service.

Mr. ANFUSO. I should like to again make it clear for the record that the proposed bill, H.R. 4986, does not intend to eliminate the existing system of granting scholarships, fellowships, and research funds to recognized institutions, nor to prevent possible future increases to those institutions by scholarships, fellowships, and research funds.

What the bill proposes to do is to provide additional facilities to provide more scientists and engineers. Do you care to comment on that?

Mr. HORNE. I think this is a most essential feature, sir. I would comment very heartily in favor of it.

Mr. ANFUSO. The committee is interested in knowing what percentage of the scientists and engineers required by the Federal Government could be produced by the National Science Academy.

We also want to know how much help the Academy could give us in matching the Soviet output of scientists and engineers. We have already inserted in the record, for example, the number of engineers and scientists put out by the Russians compared with those that we put out in the United States. I would like to ask you if you can give us any information on the number we could graduate from the Academy each year.

Mr. HORNE. This would depend upon many factors, and it would be a pure estimate.

Mr. ANFUSO. Should we have a goal, let's say a thousand a year?

Mr. HORNE. Yes, sir. I would say a goal somewhere near a thousand a year would be a fine goal, but initially it might be somewhat smaller just to get started.

Mr. VAN PELT. I was a little concerned when we established our Air Force Academy at tremendous cost to the economy. With that in mind, I am wondering again about a science academy, why that couldn't be worked in with some of our schools or some of the present facilities we have, either at West Point or at Annapolis or the Air Force Academy.

Mr. HORNE. Thinking along these lines is the basis for my belief that the Academy should be a graduate academy and not an undergraduate academy. This would greatly increase the results with reduced expense. The contract plan that I suggest for assisting youngsters to go to the present undergraduate institutions would be much less expensive, and I think would produce more capable graduates.

Mr. VAN PELT. You also commented on the advisability of practical experience. With that in mind again, many of our plants are located in the West and in various areas of the country. If we set up a science academy, using the resources that we have, would it not be easier for these people to gather their practical experience while they are continuing their postgraduate courses?

Mr. HORNE. I would think, sir, that the practical experience might be gained before they enter the graduate academy. My thought is that undergraduates don't always know what they want to do when they enter the undergraduate institution.

Mr. VAN PELT. I can appreciate that. We have a son going to school. The thing that disturbs me about our professions is that we are lengthening the period of training so much that somewhere along the line we have got to add a little more romance to induce these young people to continue their studies.

Mr. HORNE. The romance of having the research institution at the graduate level would be a tremendous enthusiastic motivation for the type of thing we are talking about, and thus would provide for the entrance of appropriate people who have graduated from existing undergraduate institutions and have had some practical experience prior to the entrance into the graduate institution. This is quite normal these days. The establishment of the graduate institution would furnish just the needed motivation and opportunity, which I think would be tremendous.

Mr. VAN PELT. One other question: You speak of Government service, with respect to the service academies and the obligation that follows graduation. We are trying to get Government out of competition with private enterprise. If there was an obligation for service after attending the Academy, how could we place these men? If the Government was giving contracts, would the man go along with the contract in the field in which he was best able to serve?

Mr. HORNE. No, sir, I think that the requirement for service would be satisfied by placing the young man in a Government research laboratory, of which we have many, in many elements of the Government service which require scientists and engineers for review, survey, and administration of the many Government science projects.

While I heartily concur in avoiding competition between Government and private industry—and I am dedicated to the proposition that free private enterprise is what made this country what it is, and the only thing that will keep it what we want it to be—the tremendous level of our scientific Government programs does require a substantial number of very highly qualified scientists and engineers in Government, with the objectivity which comes with Government service, to survey, analyze, and judge what is being done by private enterprise in research, development, and production.

Mr. VAN PELT. In the minds of a good many, the difficulty has been that we haven't, at the Government level, been able to compensate these people properly, in order to keep them and hold them in Government projects.

Mr. HORNE. This is true, sir. Rewarding them with Government work at Government expense and obligating them to serve in Government positions and institutions for a limited number of years after their graduation from the graduate academy would at the same time

give them the opportunity and the obligation to return service to the United States for this opportunity.

Mr. VAN PELT. That is all, Mr. Chairman.

Mr. ANFUSO. Mr. Daddario.

Mr. DADDARIO. Mr. Chairman, I recall very well when Admiral Horne appeared before this committee before, and I was struck by the work he was doing with the Southern California Industry Educational Council.

The statistics you quote today, Admiral, show the enrollment increases in the science and mathematics fields. While you cannot tie that directly to the work your council has been doing, it does indicate, does it not, a greater interest specifically in your area in both the science and mathematics fields?

Mr. HORNE. It certainly does, sir. The interest is there. Whether we can take any credit for it or not, I wouldn't want to say, but it is there.

Mr. DADDARIO. This being the case and because the emphasis seems to show its effect more quickly in the younger people, can we not project ourselves ahead so that we can see that in this decade there will be a comparable increase in the higher levels of education, so you will have more interest at the undergraduate level, and on a comparative basis an increase at the graduate level as well?

Mr. HORNE. I certainly hope so, sir, and I do believe so.

Mr. DADDARIO. It seems we are headed in that direction. The statistics you show would indicate that to me.

Now, I agree with you—and this has been a striking feature of these hearings to date—that the emphasis of all the witnesses has been toward the establishment of a science academy at the graduate level. It seems to me that the evidence this morning would support that particular position.

I wonder, however, about the problems we would have if we shoot for a goal of a thousand students a year at such an academy, taking the age of that group. There would be many married students and families; problems of housing and all of that. Putting that all together, wouldn't we be getting into a tremendous cost, one far beyond and above the cost of the service academies we now have, where the students are young boys, single, who don't have any great problems as far as housing, discipline, and this type of thing are concerned, and on a comparative basis the cost is minimized.

How would you overcome that particular problem?

Mr. HORNE. The graduate academy would probably not be a 4-year course. It would be a 2- or 3-year course. This would have to be analyzed to see whether a 2- or a 3-year course would be most appropriate. Thus, the students would be there for a shorter time than in an undergraudate institution.

I think that it would not be necessary to create public housing if the Science Academy were located in an appropriate place where some private housing was already available. The institution itself probably would cost no more and probably less than another service academy or undergraduate academy.

I think that it is a big undertaking, no question, and it will cost some money. The question is how to get the most results for the United States for the amount of money we spend. That is why I agree on this graduate level effort.

Mr. DADDARIO. You have indicated in your report that we could take care of the undergraduate problem by the scholarships, contracts, and existing programs in this particular area. What would you think about extending this type of program into the graduate level throughout the country, so that the universities could take a few graduate students here and there for a Ph. D. and in the aggregate come up with the same number as through the establishment of a national academy.

Mr. HORNE. Certainly a great deal could be done along that line. If we recognize that we are already using these contract-type plans to increase the number of undergraduates who would come to a B.S. level, then certainly some sort of contract plan at existing graduate schools could be used to increase the output at the master's and doctor's levels, and there still could be the obligation for service at the completion of this course. There is much to be said for the establishment of a contract-type increase in the output of our graduate schools, as you have suggested.

The only thing you would not get by this plan that I think you would get by the establishment of a graduate science academy would be the concentration in one area for specialized courses with research facilities and with the rotation of instructors that I mentioned. At a Government science graduate academy you would get these opportunities; but they would be rather more difficult, if not impractical, to get at existing universities.

Mr. DADDARIO. In the final analysis, what is really the striking feature of this, I gather, is an opportunity to centralize in one area an intellectual community through which people would gather great aid and assistance from others. You would have this research facility the chairman has referred to, and you would have better qualified scientists than through the programs we now have.

Mr. HORNE. I think that is correct, sir.

Mr. DADDARIO. And you believe the question of quality is sufficiently important so that we should strive to give the Nation the capacity to produce the highest quality of scientists we possibly can.

Mr. HORNE. That is correct, sir, I think the plant we need for more graduate training is very important, and I think the plant capacity of our present universities for increased graduate training needs some expansion. I don't think it would be any more expensive to put it in one place than it would be to try to spread it over a number of places.

Mr. DADDARIO. Thank you.

Mr. ANFUSO. Mr. Fulton.

Mr. FULTON. We are glad to have you here, and I join the others in saying you have made a good statement and we think you are doing good work.

I am always interested in how people characterize themselves. For example, you characterize yourself as an industrialist, father, former naval officer, and as an American.

Mr. DADDARIO. Will the gentleman yield? He also added to that that he is a grandfather.

Mr. FULTON. I think first I would put you down as an American, a father, a grandfather, former naval officer, and lastly an industrialist.

Mr. HORNE. If I may say, sir, I put the American citizen last because it is the most important.

Mr. FULTON. All right. I am glad to see that.

On this matter of our schools, the question with me is, do you think that, with your experience in the southern California area and your meeting obviously of a need there, successfully, in the school system, that there is a deficiency in other areas, other industrial and cultural areas of the country that should be met? You believe there is a need?

Mr. HORNE. I believe there is some, sir. The pilot program going now in southern California to motivate youngsters in the secondary schools is moving at such a rate that I would strongly recommend its adoption in other areas of the country. I think we would see its virtues extend to other areas in the country.

I am informed that in other areas of the country there is a decrease in the number of young people taking the difficult courses—the science, English, and mathematics courses—while in southern California we have had an increase in this percentage. I think we should make the effort in other parts of the country to get an increase in the percentage of our youngsters taking the more difficult courses.

Mr. FULTON. Do you see over the whole country an increasing need for action in this scientific, mathematic, and basic science field of education to which this committee should pay attention?

Mr. HORNE. That is correct, sir.

Mr. FULTON. One of the problems that I run into with young people is the feeling that they can't get into college because of the restrictions.

For example, at Penn State I have talked with the authorities there recently, and they would probably take only 25 to 33⅓ percent of the total number applying to go to Penn State University, in my own State of Pennsylvania.

That gives the young people a generally discouraged attitude about getting into college.

Do you think that that is pretty generally the feeling that in this country we are rather discouraging them and pushing them back when they eagerly ask to come in; instead of helping as you are in southern California, aiming them toward progress and a step forward into college?

Mr. HORNE. I don't think our youngsters are being discouraged from going to college. I feel quite familiar with the problems of a youngster getting into college these days—which, as you have stated, are not inconsiderable; but I would point out that the problem of the youngsters wanting to go to Penn State, a very fine college, or to Harvard or to Yale or others of the very well known colleges, is one that multiplies itself, because youngsters apply to four and five colleges and can only go to one, and so the applications are multiplied out of proportion to the number of youngsters there are who really can go.

In my experience, a youngster who wants to go to college can go. All of them can go, if they make the effort. I am afraid our problem is that the youngsters are not motivated to make sufficient effort to qualify for the school of their choice; but there is always opportunity for them to go to other schools.

Right now, today, any youngster who wants to go to college, in my judgment, can go if he is willing to apply himself. But, of course, they can't all be fortunate enough to go to Penn State.

Mr. FULTON. In fact many of these large city universities are in the same status of many thousands applying and only a few hundred taken

in each year. So that when a young person graduates from the city schools and wants to go ahead in his own city and maybe live at home and work part time, he can't. Then the question comes in a family that is perhaps depressed economically, not whether he goes to school or not, but whether he has to get a job or go to school, because he would not be able to take the job if he left the city.

Do you see that as a problem?

Mr. HORNE. We have many plans now, sir, whereby young people of appropriate effort and education at the secondary levels can borrow the money, either privately or from the Government, in order to go ahead with their education and get the full benefit of the time at the undergraduate institution without having to disperse their activities into trying to support themselves while they are there. These are wonderful plans.

Mr. FULTON. Do you just recommend that a Science Academy be established at the graduate level, or do you strongly feel that we should, in Congress, go ahead with some sort of an authorization in order to enter this field of science-mathematics?

Mr. HORNE. I am heartily in favor of the establishment of the graduate-level Science Academy. I am also in favor of an increase in the input to our existing undergraduate institutions through some contract-encouragement basis such as I have described here and such as is going on now for certain of the military services.

Mr. FULTON. You strongly recommend that this committee and the Congress enter this field of science education at the graduate level along the lines our chairman has pointed out in his proposed bill, or along its general lines; is that correct?

Mr. HORNE. That is correct, sir.

Mr. FULTON. My final point is this: Congressmen are always learning things. I read in a magazine recently that there is some sort of an education program where you could pick a teammate if you were a student and wanted to go to college and then through working for the Government half time while your teammate went to school, you and your teammate then could through that system of alternating—work for the Government and education—finance a college education. It was news to me.

My question is simply this: Do you know of that program?

Mr. HORNE. I do not, sir. It is news to me, also.

Mr. FULTON. That points up something to me because I thought possibly I had failed in learning about all the programs to help young people who apply to us.

I would like to know if anybody on the committee had heard about it.

Many people apply and say, "How do I get Federal aid or some kind of a scholarship to go to school?"

There seems to be no correlation on how a person can go ahead with some assistance. If the chairman approves, I wish this subcommittee could come up with some sort of a report which would outline the various things that are available and the various proposals that a student might seek.

Mr. MCDONOUGH. I understand that all of the available opportunities to secure advanced study—that is, the plans, the forms——

Mr. FULTON. I am talking about college as well as advanced.

Mr. McDONOUGH. Well, college courses, from the high school level up. I understand this information is available at the school level. There is a counselor in each of the schools to inform the students of the availability of these programs. If there isn't, there certainly ought to be.

Mr. FULTON. Do you know of any?

Mr. HORNE. I think there is a great deal of information available at the school level, but I find a dearth of accurate nationwide information. You would be surprised how often the counselors counseling our children in the high schools need the kind of help Mr. Fulton has suggested.

Mr. ANFUSO. Might I suggest looking into that and perhaps putting it into our report?

Mr. FULTON. I want to thank the witness for his excellent statement.

Mr. McDONOUGH. There is a variety of Government agencies that have such programs. How they disperse information to interested parties is something I am not familiar with, except that I know at the school level there are school counselors who inform the students of the many opportunities.

I appreciate your appearance here today very much, Admiral Horne, and your reference to the Southern California Industrial Education Council.

It seems to me that the interest in scientific and engineering courses follows more or less the pattern of the economy in each area of the country. I mean that there are available in the State of Pennsylvania, for instance, many fine engineering schools because the basic industries, steel and coal and matters of that kind, are predominant.

In the Midwest you have the agricultural schools.

Mr. FULTON. We supply football players, too.

Mr. McDONOUGH. That is extracurricular.

Now, on the Pacific coast, and especially in southern California, there are so many opportunities on a wide, diversified scale in science and art, and of recent years, especially in electronics and atomic energy and in jet propulsion, in aircraft and many things, that the student can see an immediate benefit to taking that kind of a course and he sees the people engaged in those pursuits around him all day in his daily life. He sees people in these various professions, reads about them and hears about them. He becomes more interested. Probably the stimulus should be to find some of the talent that is located in other areas—that is not in that immediate area—to correct the deficiencies that you speak about, of some 10,000 scientists and engineers each year.

I believe that a student devoted to pursuing a course in science and engineering has got to have an avocation for it. You just don't tell a youngster, "I want you to be a scientist" or "I want you to be an engineer." You might encourage him to be, but to be a good engineer, he has to have a more or less inside desire to pursue that kind of course. I know many, many students who have started on that course and found it impossible. They couldn't coordinate their mental processes to pursue the course properly.

I believe the Science Academy is a motivating force and should be very good.

I don't want the average American student to feel the Federal Government is the only source he can lean on for an education, be-

cause then we would be creating a lot of future bureaucrats who have to depend on the Government for the rest of their lives, and we don't want that.

Mr. FULTON. Would you yield?

Mr. MCDONOUGH. Yes.

Mr. FULTON. I think that this southern California group is more than just propinquity. I think they have taken the leadership in motivating and directing, so I would disagree with you that it is simply that people near that kind of community end up that way. Otherwise, I couldn't explain why most of the Navy personnel come from the Midwest.

Mr. MCDONOUGH. There is a different reason there.

Mr. FULTON. I would imagine they have a tendency toward a certain kind of an education, but I don't think the propinquity had much to do with it.

Mr. HORNE. I think it is true that you cannot force youngsters to become scientists, engineers, lawyers, doctors, or Congressmen. You have to motivate them.

Now, I think the way that you motivate youngsters is pretty much the same no matter where the youngsters are. You have to give them the opportunity; you have to give them the leadership; you have to give them something that they can see and get next to, and then you have to follow through. This is where our many youth programs do very fine things. You have all heard of the junior achievement programs, and we all know what the Boy Scouts and the YMCA are doing, and other organizations of that nature. But we do need in this very complex age of ours real effort; and we adults must make this effort to reach these youngsters, to motivate them at the time when they need motivation. This is the most tremendous problem that we face, and nothing that we do is really more important than this.

This motivation, gentlemen, is the real key to it, and this does not come through clans or propinquity; it comes only through applied effort on the part of adults to assist these youngsters and to guide them and to work with them.

Mr. MCDONOUGH. Mr. Chairman, that is true. I think motivation is very good. However, you find that some of the great men of science and engineering pursued the course in the face of great obstacles. They were not only not motivated; they were discouraged.

Take Thomas Edison, for instance. He was certainly discouraged in his youth as far as pursuing the course is concerned. They did everything possible to divert him off into some other channel. Mentally he had a desire to go in that direction and pursued it. The same is true with some great chemists of the past.

On the other hand, compare our voluntary scientists and engineers of the future, those who have the motivation within themselves, with the type of engineers and scientists that Russia is producing today, They say to the students at a certain school level, "Your school grades indicate that you should pursue this course, and that is the course you will pursue. You are doing it for the state and the greater good of humanity." That is in the Soviet Union. I don't know whether that is too good a scientist to have. He does it because he has to. He can't do anything else. I would rather have them do it because they want to.

Mr. HORNE. Well, sir, freedom of opportunity and freedom of choice are the things many of us are willing to fight for.

Mr. MCDONOUGH. They have their drawbacks, too, because many people go off into various channels because of the freedom. There is that angle of it, too.

Mr. ANFUSO. I would like to ask my colleague from California, Mr. McDonough, and also the admiral, whether either of you would have any serious objections to having the Academy in California?

Mr. FULTON. I don't know. I think the admiral would be able to give a good start to it.

Mr. ANFUSO. While we have you here, I would like to ask you this question: We have just put up the Midas, and pretty soon we hope to put up the Samos. Would you say that those are in peaceful pursuits? Would you say that those two satellites would deter war eventually by the discoveries which they brought about?

Mr. HORNE. I don't feel qualified to comment in detail on either of those programs. I am not connected with them, with either of them, and I only know very general things about them. I think I can say this: I feel that the efforts of our NASA are directed at acquiring essential scientific information about space which will help us tremendously in peaceful pursuits and which will add to our knowledge for all necessary purposes.

Now, the programs that you mentioned in my judgment are programs to add to our knowledge and not for any particular military purpose. They will add to our knowledge tremendously and therefore I think are good programs.

Mr. ANFUSO. Are there any further questions?

Mr. DADDARIO. In this discussion about motivation and opportunity and all that type of thing, we have fallen a little bit into the habit of looking down our noses at the Russian achievements in the field of science and mathematics.

I think there is proof that national effort, national direction, and patriotism and national objectives do build up a desire among young people to follow certain courses and to take certain subjects.

Just the other day I was reading the book "Moscow and Beyond," and one of the chapters touched on that subject. The author was amazed, after returning to Russia after 6 or 7 years, at the amount of interest there was in the field of science and that there would be discussions about science in the restaurants and in the stores between young people.

I think this follows through on what you have said earlier, that if you have programs, if you have opportunity, if you build up national aims and objectives, and if there is some glamour, it certainly does tend to build up interest in the field of science and mathematics. I think that applies in this country and in other countries throughout the world, don't you?

Mr. HORNE. Yes, sir, I do.

Mr. ANFUSO. Thank you very much, Admiral Horne. You have made a most valuable contribution and we deeply thank you.

Mr. HORNE. Thank you, gentlemen. It has been a privilege to appear before this committee.

(Whereupon, at 11:30 a.m., the subcommittee was adjourned.)

×